

The life history of *Itylos titicaca* (Weymer 1890) (Lepidoptera, Lycaenidae, Polyommata) at 5200 m in the Chilean altiplano

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<https://zoobank.org/B2111BBD-BDB5-4BDB-9A47-51635B557F9F>

Received 12 May 2022; accepted 7 August 2022; published: 18 August 2022

Subject Editor: Zdenek Fric.

Abstract. *Itylos titicaca* (Weyner 1890) has been reported to have a narrow distribution range associated with Andean wetlands called “bofedales” in Peru, Bolivia, northeast Chile and northwest Argentina. In Chile its distribution is between the upper Puna and lower Alpine belts, recorded from 3800 to 4900 m. This study reports a new elevation record of *I. titicaca* above 5200 m at Sora Pata Lake, northeast of Caquena in the highlands of the Chilean altiplano. Furthermore, this finding establishes the highest report for the genus *Itylos*, and one of the highest reports for the family Lycaenidae, with several records of individuals breeding in extreme elevations. Further data, principally from Himalayas and other high mountain ranges, is needed to confirm whether this could be the highest record for the family Lycaenidae.

Introduction

Itylos Draudt, 1921 is a butterfly genus with restricted distribution within the subtribe Polyommata (Talavera et al. 2013), associated with the highest regions of the Andes from Southern Ecuador to northwest Argentina and northeast Chile up to an elevation of almost 5000 m. The genus has six described species (*I. fumosus*, *I. mashenka*, *I. mira*, *I. pasco*, *I. pnin* and *I. titicaca*) (Lamas 2004), from which only *I. titicaca* (Fig. 1) has been recorded for Chile with a distribution in the upper Puna and lower Alpine belts, inhabiting the alpine wetlands of Arica-Parinacota to Antofagasta regions. Benyamini et al. (2014) described that in Bolivia *I. titicaca* lay their eggs on *Plantago tubulosa*, a species native to America. Other plant species of the Andean wetlands have been described as hosts for *Itylos* species, such as *Oxychloe* spp (Shapiro 1985).

Itylos titicaca is one of the smallest butterflies in the world; its wingspan is between 10 and 17 mm; it can survive intermittent snowy and icy conditions occurring in its habitat. The Andean Altiplano is a region located at elevations between 3700 and 4600 m, which includes several hydrographic basins delimited by two mountain ranges of the central Andes (Lavenu *et al.* 1984). This region has a fragmented system of Alpine wetlands that are separated by Andean lakes with most precipitation concentrated in the austral summer, during the South American summer monsoon (SASM) (Zhou and Lou 1998).

However, cycles of increased rainfall and extensive palaeolakes have been described during the Pleistocene, which covered a large part of the basin (Placzek *et al.* 2011, 2013), giving rise to extensive salt flats formed by the desiccation of saline lakes located in various Altiplano areas (Risacher and Fritz 2009).

Until now the highest elevation for *I. titicaca* was recorded at 4500 m in the Atacama region and 4900 m in the department of Arequipa in Peru (Moya and Sarmiento 2015). Although Lycaenidae are one of the more diverse lepidopteran families worldwide, the South American endemic genus *Itylos* has been poorly studied, with no major efforts beyond a few biological observations or changes to its taxonomical status. Therefore, this study marks an important record for the elevation range of *I. titicaca* and for the Lycaenidae fauna in the world. This new elevation record is valuable evidence that may contribute to a better understanding of the life history and evolution of this species.

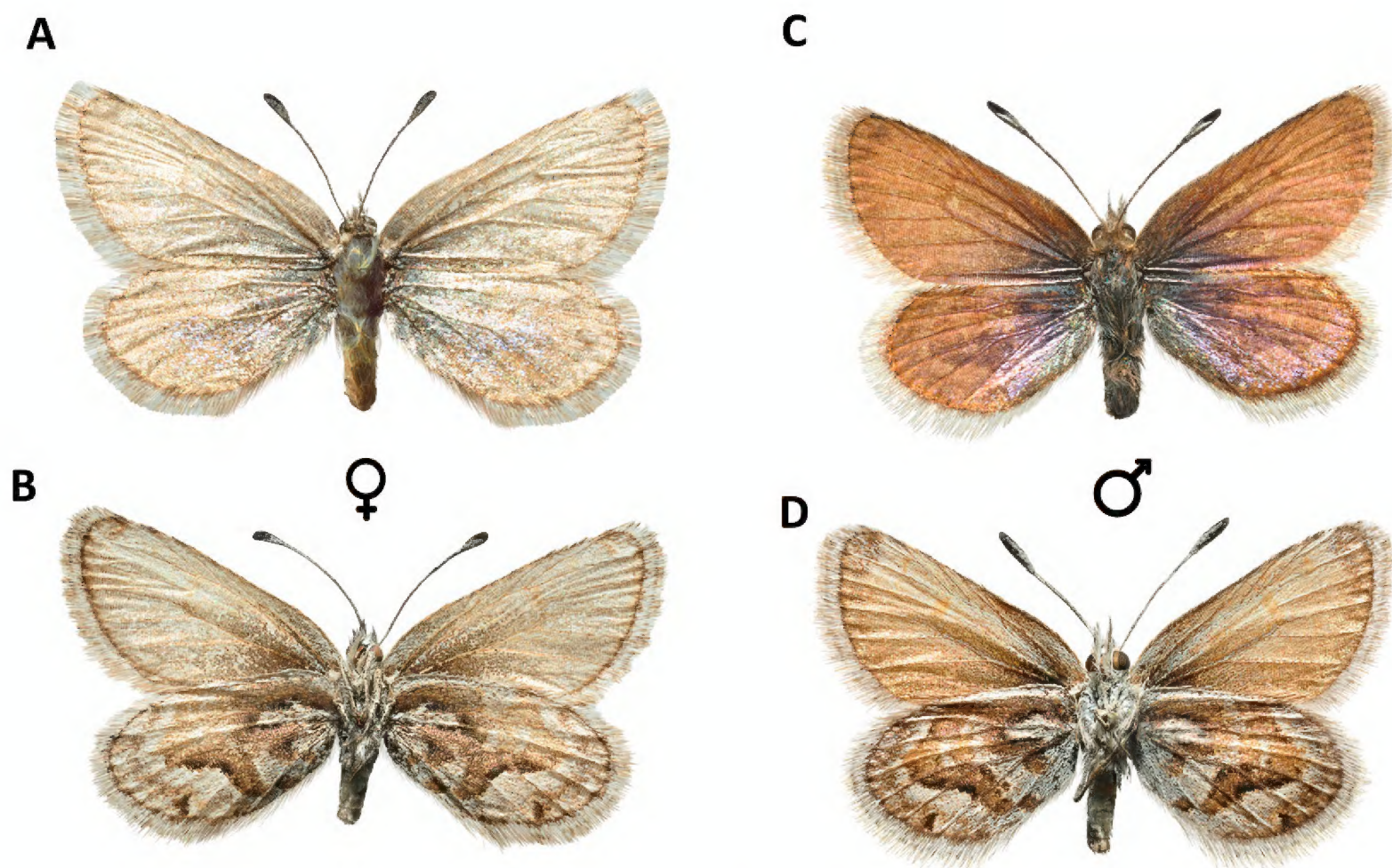


Figure 1. Dorsal and ventral view of *Itylos titicaca* (Weyner, 1890). **A.** Dorsal Female; **B.** Ventral Female; **C.** Dorsal Male; **D.** Ventral male.

Materials and methods

In April, 2018, *Itylos titicaca* butterflies were observed flying at multiple localities in the Andean Altiplano; one of the highest points was around the Caquena village at Sora Para lake at 5000–5200 m (Fig. 2) (18.0635°S, 69.0662°W) in the northern Altiplano, next to another series of lakes called Casiri Lakes at 4838 m, where multiple individuals of *I. titicaca* were also observed.

Benyamini et al. (2014) reported for Chile that the hosts of *I. titicaca* are mostly *Plantago* spp., closely tied to Altiplano green wetlands or bofedales. During a second expedition in May 2019, following a route with presence of *Oxychloe andina*, we explored a few kilometers north up to Sora Pata lake at around 5200 m (18.0635°S, 69.0662°W) (Fig. 3). An established population of *I. titicaca* was found flying and visiting the wetlands, principally flowers of *Oxychloe andina* and *Deuyexia* spp. surrounding the lake.

Results

This note reports the first population of *I. titicaca* ever recorded flying at 5200 m in the high Andean Altiplano, around Sora Pata Lake (Fig. 3). The species was found to be highly abundant in the wetland and females were observed laying eggs on *Oxychloe andina*, suggesting the existence of an established population in the area.

Sora Pata Lake is surrounded by mountains, providing this place at around 5200 m with a unique microhabitat protected from the strongest winds (Fig. 4). Individuals of *I. titicaca* were collected and processed for future molecular analysis and morphometric studies.

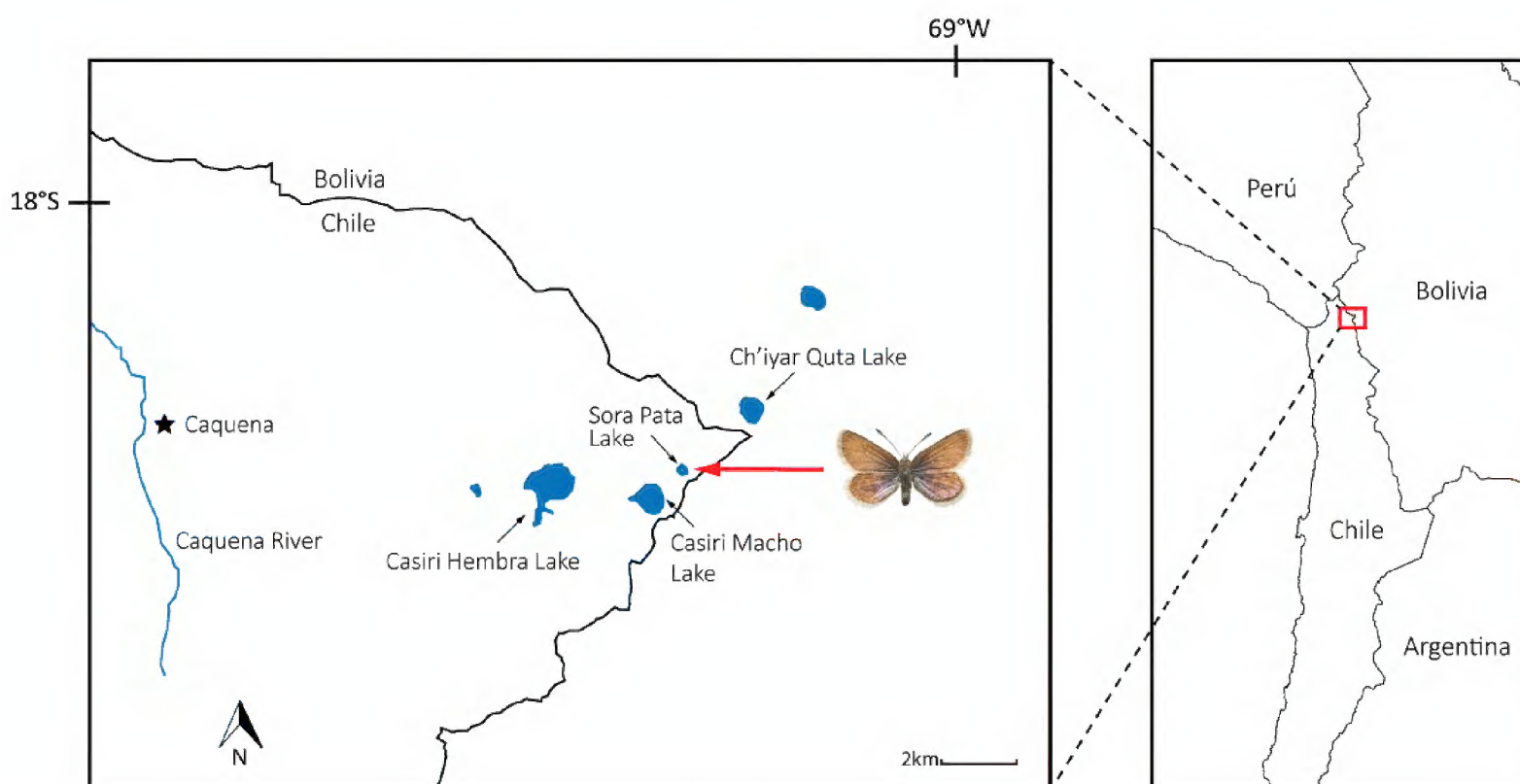


Figure 2. Map of northern Chile showing selected Andean lakes; Sora Pata Lake close to the Bolivian border with elevations up to 5000 m.



Figure 3. *Itylos titicaca* individuals recorded on *Oxychloe andina* at Sora Pata Lake, Chile.

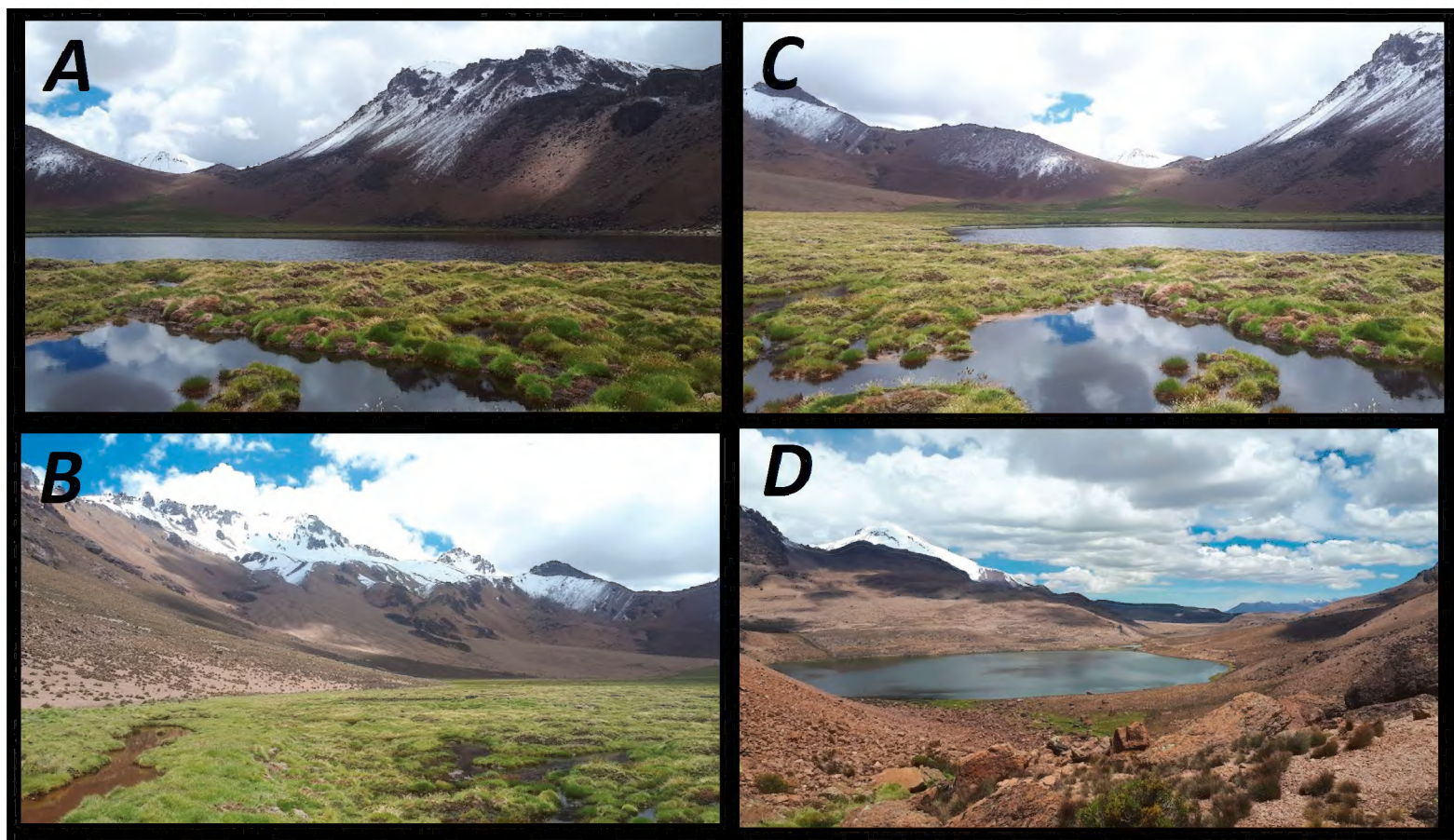


Figure 4. A–C. Northern Andean Lake Sora Pata, near Caquena village in the Chilean Altiplano and Bolivian border; D. View from Sora Pata to Casiri Macho Lake at 4838 m.

Discussion

The genus *Itylos* is one of the smallest species of butterflies, restricted to the Andean highlands. None of the six species of this genus has been well studied, so this elevation record for *I. titicaca* establishes a starting point to analyze the general ecological pattern of distribution of this species, particularly in northeast Chile, where it has practically not been studied.

Itylos titicaca is the only species of the genus occurring in Chile; it also occurs in the highlands of Peru and Bolivia and northwest Argentina (Balint and Johnson 1994). The Altiplano in Chile (from approximately 17°30'S to 24°S), limited on the west by the Andes, has a dry, cold climate with a mean elevation of approximately 5000 m., which allows the development of almost exclusively steppe vegetation and bofedales. Despite this extreme environment, different groups of insects inhabit this area. Different groups of butterflies (Nymphalidae, Pieridae and Hesperiidae) have also been observed flying and sharing the niche with Pieridae, like *Hypsochila* spp. and *Phulia* spp., and the migrant nymphalid *Vanessa carye* (Benítez et al. 2019).

Itylos titicaca is one of the most widely distributed *Itylos* species, closely related to Andean highland wetlands associated with the Titicaca Lake basin (Balint and Johnson 1994). Here we report the highest ever elevational record for the genus *Itylos*, and one of the highest if not the highest record for the family Lycaenidae. As in other members of the genus *Itylos*, the high-elevation occurrence of *I. titicaca* is one of the most important facets of the ecological pattern of distribution of one of the most poorly understood specialist butterfly species of the Andean highlands and indeed South America.

Acknowledgements

The authors thank Project Fondecyt de Iniciación N° 11180366, Maria de los Angeles Medina and the project MICRA Mariposas for providing a good quality picture of *Itylos titicaca*. Also, thanks to Maritza A. K. Mihoc for identifying wetland plants from Sora Pata Lake, and to Zdenek Fric, Robert Robbins and Roger Vila as well as David Lees for reviewing this manuscript. FCJ and AVL thanks CONICYTPCHA/doctorado nacional 2015-21150821, 2018-21180921.

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